

CLAIMS

1. A pump for transferring particulate material from a source of particulate material to a remote location, comprising:

a particulate chamber having a first open end and a second open end;

5 a first conduit connecting said first open end of said particulate chamber to said source of particulate material and a second conduit connecting said second open end of said particulate chamber to said remote location;

a first check valve at said first open end and a second check valve at said second open end of said particulate chamber;

10 a source of vacuum connected to said particulate chamber adjacent said second open end;

a source of gas under pressure connected to said particulate chamber adjacent said first open end; and

a control, alternatively

15 (1) connecting said source of vacuum to said particulate chamber, thereby opening said first check valve, closing said second check valve and drawing a vacuum in said particulate chamber filling said particulate chamber with particulate material from said source of particulate material through said first conduit;

(2) connecting said source of gas under pressure to said
20 particulate chamber, thereby closing said first check valve, opening said second check valve and driving said particulate material from said particulate chamber to said remote location through said second conduit; and

(3) cyclically repeating steps (1) and (2) to transfer discrete
volumes of particulate material from said source of particulate material to said remote
25 location.

2. The pump for transferring particulate material as defined in Claim 1, wherein said particulate chamber is generally cylindrical having a substantially constant cylindrical internal diameter.

5 3. The pump for transferring particulate material as defined in Claim 2, wherein said cylindrical internal diameter of said particulate chamber is between 0.25 and 1.5 inches.

4. The pump for transferring particulate material as defined in Claim 2,
10 wherein said cylindrical internal diameter of particulate chamber is between 0.5 and one inch.

5. The pump for transferring particulate material as defined in Claim 2, wherein said particulate chamber has a length to internal diameter of at least 20 to 1.
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6. The pump for transferring particulate material as defined in Claim 1, wherein said particulate chamber includes an outlet communicating with said source of vacuum receiving an overflow of particulate material from said particulate chamber and said source of vacuum is connected to said source of particulate material
20 returning said overflow of particulate material from said particulate chamber to said source of particulate material.

7. The pump for transferring particulate material as defined in Claim 6, wherein said source of vacuum is a venturi pump including a venturi nozzle and a
25 source of compressed gas under pressure directed through said venturi nozzle.

8. The pump for transferring particulate material as defined in Claim 6, wherein said pump includes a pinch valve limiting said overflow of particulate material to said source of vacuum.

5 9. The pump for transferring particulate material as defined in Claim 8, wherein said outlet is said second open end of said particulate chamber, said pinch valve surrounding said second open end of said particulate chamber and said pinch valve connected by a line to said source of vacuum.

10 10. The pump for transferring particulate material as defined in Claim 9, wherein said pinch valve is enclosed within an annular chamber surrounding said second open end of said particulate chamber and said line to said source of vacuum is connected to said annular chamber.

15 11. The pump for transferring particulate material as defined in Claim 1, wherein said check valves are ball check valves.

12. The pump for transferring particulate material as defined in Claim 11, wherein said ball check valves include a ball formed of a resilient material.

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13. The pump for transferring particulate material as defined in Claim 12, wherein said ball is formed of rubber.

14. The pump for transferring particulate material as defined in Claim 1,
wherein said pump includes a particulate overflow valve communicating with said
source of vacuum and said source of vacuum is connected by a line to said source of
particulate material returning overflow of said particulate material from said
5 particulate chamber to said source of particulate material and wherein said discreet
volumes of particulate material are substantially a volume of said particulate chamber.

15. A pump for transferring powder paint from a source of powder paint to a remote location, comprising:

a powder paint chamber having a substantially constant cylindrical internal diameter including a first open end and a second open end;

5 a first conduit connecting said first open end of said powder paint chamber to said source of powder paint and a second conduit connecting said second open end of said powder paint chamber to said remote location;

an inlet valve at said first open end of said powder paint chamber and an outlet valve at said second open end of said powder paint chamber;

10 a source of vacuum connected to said powder paint chamber adjacent said second open end;

a source of gas under pressure connected to said powder paint chamber adjacent said first open end; and

a control, alternatively

15 (1) connecting said source of vacuum to said powder paint chamber, opening said inlet valve, closing said outlet valve and drawing a vacuum in said powder paint chamber filling said powder paint chamber with powder paint from said source of powder paint through said first conduit;

(2) disconnecting said source of vacuum from said powder paint
20 chamber and connecting said source of gas under pressure to said powder paint chamber, closing said inlet valve, opening said outlet valve and driving said powder paint from said powder paint chamber to said remote location through said second conduit; and

(3) cyclically repeating steps (1) and (2) to transfer discrete
25 volumes of powder paint from said source of powder paint to said remote location.

16. The pump for transferring powder paint as defined in Claim 15, wherein said inlet and outlet valves are check valves, whereby connecting said source of vacuum to said powder paint chamber opens said inlet valve and closes said outlet valve and connecting said source of gas under pressure to said powder paint chamber
5 closes said inlet valve and opens said outlet valve.

17. The pump for transferring particulate paint material as defined in Claim 16, wherein said check valves are ball check valves, each including a ball formed of a resilient material.

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18. The pump for transferring powder paint material, as defined in Claim 15, wherein said cylindrical internal diameter of said powder paint chamber is between 0.25 and 1.5 inches.

15 19. The pump for transferring powder paint as defined in Claim 15, wherein said pump includes an overflow valve communicating with said source of vacuum and said source of vacuum connected by a line to said source of powder paint returning overflow of powder paint from said powder paint chamber to said source of powder paint, whereby said powder paint chamber is substantially filled with powder
20 paint upon connecting said source of vacuum to said powder paint chamber and said discrete volumes of powder paint are substantially the volume of said powder paint chamber.

20. The pump for transferring powder paint as defined in Claim 15, wherein said particulate paint chamber has a length to internal diameter ratio of at least 20 to 1.

5 21. The pump for transferring powder paint as defined in Claim 15, wherein said source of vacuum is a venturi pump including a venturi nozzle and a source of compressed gas under pressure directed through said venturi nozzle.

10 22. The pump for transferring powder paint as defined in Claim 21, wherein said powder paint chamber includes an outlet communicating with said venturi nozzle receiving an overflow of powder paint from said powder paint chamber and said venturi nozzle connected to said source of powder paint by a line receiving overflow powder paint from said venturi nozzle connected to said source of powder paint.

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23. The pump for transferring powder paint as defined in Claim 22, wherein said outlet is said second open end of said powder paint chamber and said pump includes a pinch valve surrounding said second open end of said powder paint chamber and said pinch valve is connected by a line to said venturi pump.

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24. The pump for transferring powder paint as defined in Claim 23, wherein said pinch valve is enclosed within an annular chamber surrounding said second open end of said powder paint chamber and said line to said venturi pump is connected to said annular chamber.

25. A pump for transferring powder paint from a source of powder paint to a remote location, comprising:

a powder paint chamber having a substantially constant cylindrical internal diameter including a first open end and a second open end;

5 a first conduit connecting said first open end of said powder paint chamber to said source of powder paint and a second conduit connecting said second open end of said powder paint chamber to said remote location;

a ball check valve at said first open end and a second ball check valve at said second open end of said particulate paint chamber;

10 a source of vacuum connected to said powder paint chamber adjacent said second open end;

a source of gas under pressure connected to said powder paint chamber adjacent said first open end;

15 a powder paint overflow valve adjacent said second open end of said powder paint chamber receiving overflow of powder paint from said powder paint chamber;

a line between said powder paint overflow valve communicating with said source of powder paint returning said overflow of powder paint to said source of powder paint; and

20 a control, alternatively:

(1) connecting said source of vacuum to powder paint chamber, thereby opening said first ball check valve, closing said second ball check valve and drawing a vacuum in said powder paint chamber, filling said powder paint chamber with powder paint from said source of powder paint through said first conduit and

closing said powder paint overflow valve when said powder paint substantially fills said powder paint chamber;

(2) connecting said source of gas under pressure to said powder paint chamber, thereby closing said first ball check valve, opening said second ball check valve and driving said powder paint from said powder paint chamber to said remote location through said second conduit; and

(3) cyclically repeating steps (1) and (2) to transfer predetermined discrete volumes of powder paint substantially equal to a volume of said powder paint chamber from said source of powder material to said remote location.

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26. The pump for transferring powder paint as defined in Claim 25, wherein said overflow valve is a pinch valve and said source of vacuum is a venturi vacuum pump including a venturi nozzle and a source of gas under pressure directing gas and overflow powder paint under pressure through said venturi nozzle.

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27. The pump for transferring powder paint as defined in Claim 26, wherein said line includes a first line connected between said pinch valve and said venturi vacuum pump and a second line between said venturi vacuum pump and said source of powder paint.

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28. The pump for transferring powder paint as defined in Claim 26, wherein said pinch valve surrounds said second open end of said powder paint chamber.

29. The pump for transferring powder paint as defined in Claim 28, wherein said pinch valve is enclosed within an annular chamber surrounding said second open end of said powder paint chamber and said line is connected between said annular chamber and said venturi vacuum pump.